REVISION OF THE AUSTRALIAN GHOST MOTHS (LEPIDOPTERA HOMONEURA, FAMILY HEPIALIDAE)

PART II.[1]

By NORMAN B. TINDALE, B.Sc., South Australian Museum.

Fig. 1-92.

Oncopera Walker.

Oncopera Walker, List Lep. Ins. Brit. Mus., vii, 1856, p. 1558.
Oncoptera Meyrick, Proc. Linn. Soc. N.S. Wales, iv (2), 1889, p. 1124.
Oncopera Eyer and Turner, Proc. Linn. Soc. N.S. Wales, i, 1925, p. 272.

Antennae of few segments, usually from fourteen to twenty, very short, less than one-sixth length of forewing, almost cylindrical, either swelling gradually towards the apex to form a club, or filamentous; a tuft of hairs on the basal segment projects over the eyes. The labial palpi only moderately developed, slender, projected straight forwards, concealed in dense hairs, the maxillary palpi short, obsolete, and concealed. Males with hind tibiae with large curved tuft of hairs arising from an expansion of the margin. Veins R_1 and R_5 of forewings stalked either before, at, or after radio-median cross-vein. Vein M_1 of hindwings forms a distinct Y-fork with radio-median cross-vein.

Genotype: *O. intricata* Walker, 1856.

Members of this genus are easily distinguishable from all other genera of the family by the short subclavate or filamentous antennae and by the tibial hair-tufts of the males. At least twelve species are known. They range from Tasmania northward to Kuranda in North Queensland and westward as far as Mount Gambier in South Australia. Most of the species are grass feeders in the larval state and are potentially harmful to pastures. At least two species, *O. mitocera* on the Atherton Tableland and *O. intricata* in Tasmania are major farm pests. Other species have been recorded as injuring grazing lands in the wetter parts of Victoria.

The distribution of the members of the genus (fig. 1) lies entirely within the belt of thirty-inch annual uniform rainfall, and each species appears to be re-

(1) Part I, published in Rec. S. Aust. Mus., iv, 1932, pp. 497-536.

stricted within relatively narrow general limits of climate. That temperature is an important factor seems to be confirmed by the study of the range of *O. alboguttata* which occurs near sea-level at Sydney at the southern end of its range, again at some elevation in the Dorrigo district, about three hundred miles further north, and at 3,000 feet in the National Park in southern Queensland.

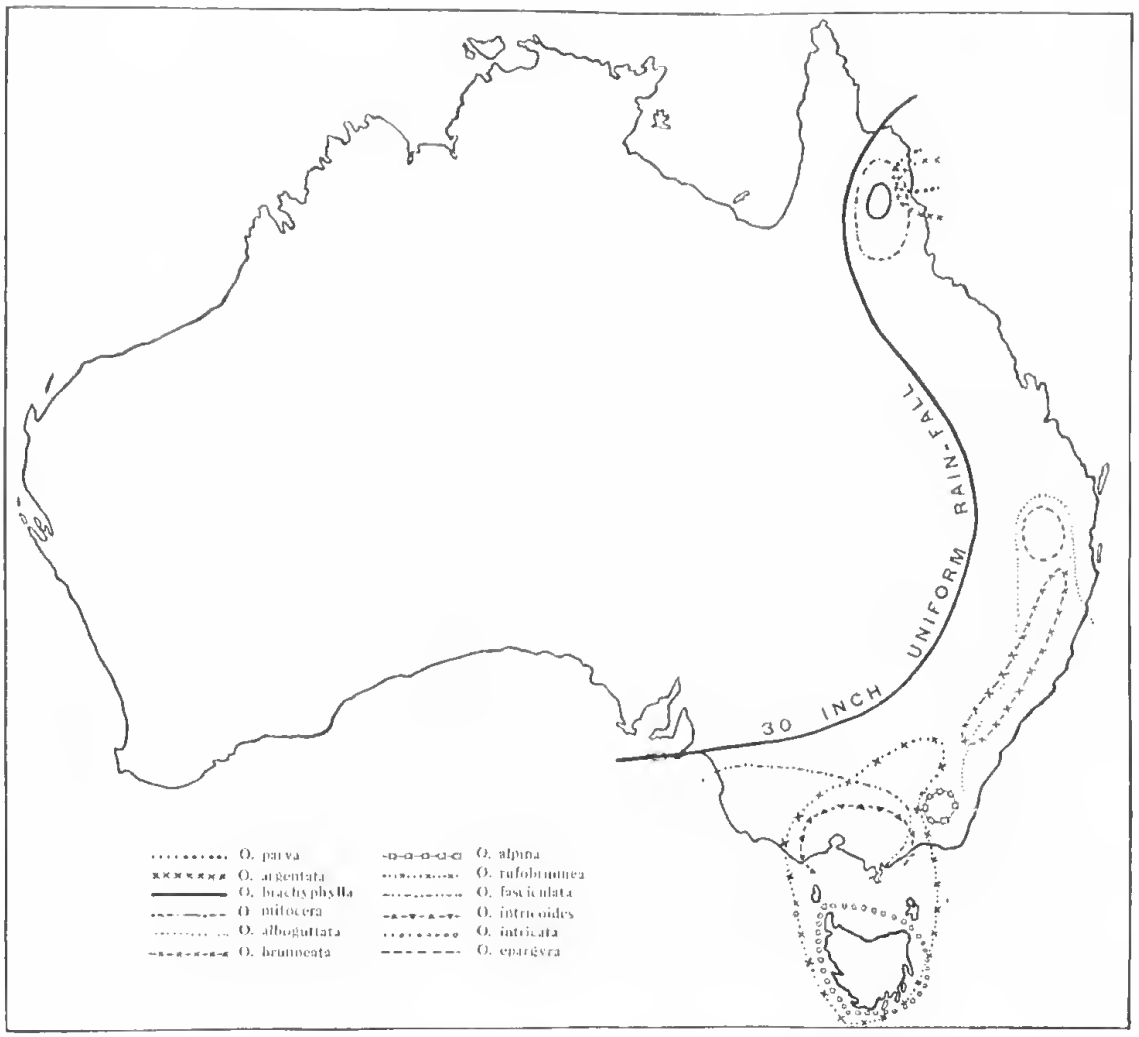

Fig. 1. Distribution of the species of *Oncopera.*

Four species appear to be present on the Atherton Tableland; two of them have been described from unlocalized specimens labelled "Cairns District," but it appears probable that they were not collected on the lowlands.

The presence or absence of a sacculus in the male genitalia might be used to divide the genus into two sections, (a) a northern one embracing *O. miltocera*, *O. parva*, *O. argentata* and *O. brachyphylla* and (b) a southern one containing the

other seven species. *O. parva*, *O. argentata*, and *O. brunneata* are linked by the common possession of specialized white scales on the undersides of the hindwings. The form of the eighth sternite tends to link *O. mitocera* and *O. brunneata*, species otherwise quite apart.

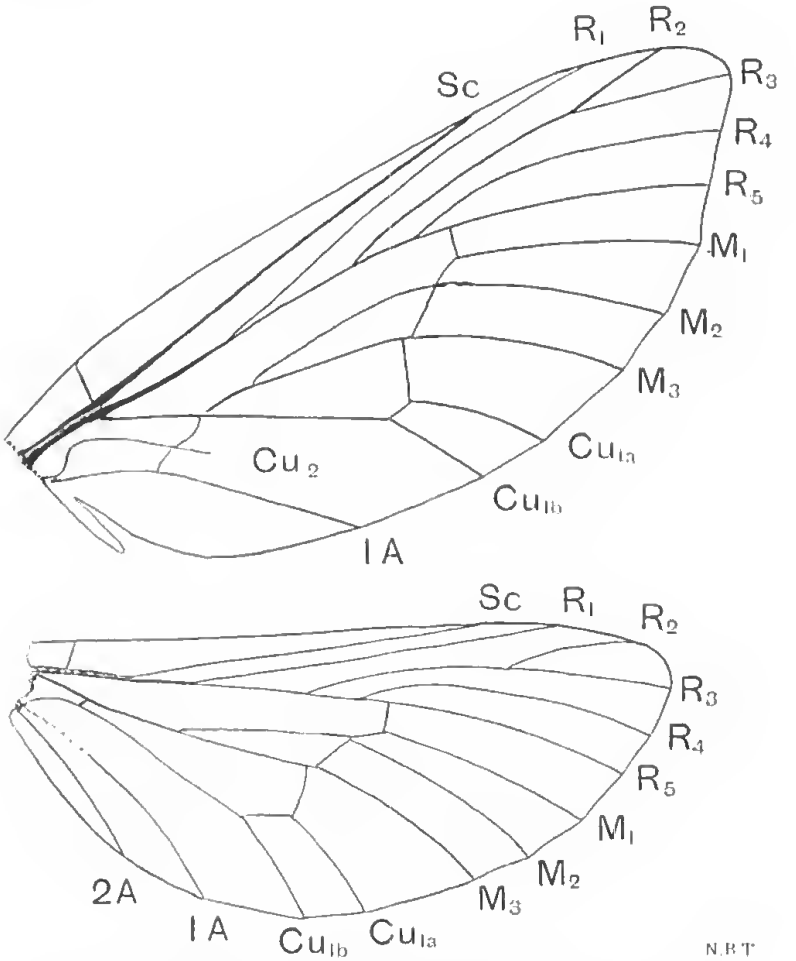

Fig. 2. *Oncopera fasciculata* (Walker) Venation, male.

The form of the antennae provides a natural subdivision of the genus. Clavate antennae are characteristic of the typical subgenus (with *O. intricata* as type); this contains all of the southern species (Victoria, Tasmania and alpine New South Wales) *O. fasciculata*, *O. alpina*, *O. intricoides*, and *O. rufobrunnea*.

The subgenus *Paroncopera* subgen. nov. (with *O. mitocera* as type) contains the other seven species, including *O. alboguttata*, *O. brunneata*, *O. brachyphylla*, *O. parva*, *O. argentata*, and *O. epargyra*. They are characterized by possessing filamentous antennae, usually clothed with large flattened scales.

O. albofasciata, in the sum of its characters probably stands as the most

generalized member of a specialized genus; it has links on the one hand with *O. brachyphylla* and *O. miloccra* and also, somewhat less obviously, with the typical subgenus.

Philpott (2) figured as characteristic of the genus the venation of an example of *O. miloccra* in which R_4 of forewing forks with R_5 distally from the radio-median cross-vein. This must be exceptional even within the species, for in twenty-two out of twenty-three examples examined for this character, it appears to branch at the cross-vein. The character may be a variable one for in *O. albo-guttata* the fork may be either before, at, or well after the cross-vein. In all members of the typical subgenus and in *O. brunnicata*, however, the forking is well before that vein.

For the detailed study of the members of this genus genitalia preparations are useful. Owing to its lower refractive index choral hydrate is preferable to balsam as a temporary mounting medium. Type preparations should be subsequently remounted in balsam for permanent storage. The characters of the vinculum, harpe, tegumen and eighth sternite are of special importance. The juxta is often not well chitinized and is difficult to examine without dissection. In *O. intricoides* and *O. rufobrunnea* it is folded down so as to appear transverse. In *O. alpina* this does not appear to happen. When detached it is seen to be broadly concave on the posterior margin in the last-named species, with an obscure median notch. In the two former species it is then longer than wide, slightly convex on posterior margin, which bears an acute median notch.

For material for the study of the members of this genus I am particularly indebted to Messrs. G. F. Hill and A. Tonnoir, of the Entomological Division, C.S.I.R., and to Mr. C. G. L. Gooding, of Moe, who made special collections.

KEY TO THE SPECIES OF ONCOPERA.

(based on male genitalia)

a. Sacculus absent (a saccular lobe sometimes present).
  b. Vinculum with heavily chitinized portion wider than long .. .. *intricata*
  bb. Vinculum with heavily chitinized portion longer than wide.
    c. Harpe with shaft neither dilated nor strongly bent at one half.
      d. Tegumen with mesal processes broadly triangular, acutely terminated, marginal armature almost obsolete .. .. *fasciculata*

(2) Philpott, Trans. Ent. Soc., Lond., 1925, pl. lii.

dd. Tegumen with mesal processes not broadly triangular, but blunt-pointed and armed with conspicuous marginal denticles.
c. Denticles of tegumen acute.
f. Juxta with ventral margin not broadly concave.
g. Eighth sternite with protuberance obsolete .. .. *rufobrunnea*
gg. Eighth sternite with well-developed protuberance .. .. *intricoides*
ff. Juxta with ventral margin broadly concave .. .. *alpina*
cc. Denticles of tegument rounded .. .. *albiguttata*
cc. Harpe dilated and strongly bent at one half .. *brunneata*
aa. Sacculus present.
b. Saccului short .. .. *brachyphylla*
bb. Saccului long.
i. Tegumen unarmed.
j. Base of harpe slender .. .. .. *parva*
jj. Base of harpe broad.
k. Cucullus dilated apically .. .. *argentata*
kk. Cucullus not dilated apically .. *eparguya*
ii. Tegumen armed with denticles .. .. *mitocera*

KEY TO THE SPECIES OF ONCOPERA

(based on general characters).

a. Forewings with an inner marginal fascia.
b. Forewings with dull white markings forming a subreticulate pattern.
c. Males.
d. Hindwings with ciliae not unicolorous.
e. Abdomen and legs light fuscous . .. *intricata*
ee. Abdomen and legs dark brown .. .. *alpina*
dd. Hindwings with ciliae unicolorous .. .. *intricoides*
cc. Females.
f. Wings broad .. .. *intricoides*
ff. Wings narrow.
g. Markings obscure .. .. .. *intricata*
gg. Markings well defined .. .. .. { *fasciculata* / *alpina* }
bb. Forewings without dull white markings: males .. *fasciculata*
aa. Forewings without inner marginal fascia.
b. Antennae clubbed.
i. Forewings brown; male.. .. .. .. *rufobrunnea*
ii. Forewings grey; female .. .. .. *rufobrunnea*
bb. Antennae not clubbed.

j. Males.
  k. Hindwings beneath with dense silvery-white scales on posterior half.
    l. Forewings with oblique ochreous-brown fascia from apex to two-thirds inner margin .. .. *brunneata*
    ll. Forewings without oblique fascia.
      m. Hindwings above with silvery-white scales .. .. .. *argentata*
      mm. Hindwings above without silvery-white scales .. .. .. *parva*
  kk. Hindwings beneath without silvery-white scales.
    n. Forewings pointed at apex .. .. { *alboguttata* / *eparggra* }
    nn. Forewings not pointed at apex.
      o. Forewings short and broad .. *brachyphylla*
      oo. Forewings not short and broad .. *mitocera*
jj. Females.
  p. Expanse less than 45 mm. .. .. { *brunneata* / *parva* }
  pp. Expanse greater than 45 mm.
    q. Forewings with numerous obscure ocellate markings of small size *alboguttata*
    qq. Forewings without numerous obscure ocellate markings .. *mitocera*

ONCOPERA INTRICATA Walker.

Fig. 3-11.

Oncopera intricata Walker. List Lep. Ins. Brit. Mus., vii, 1856, p. 1559.
Oncoptera intricata Meyrick, Proc. Linn. Soc., N.S. Wales, iv (2), 1889, p. 1124.
Oncopera intricata Hill, Australian Council for Sci. and Indust. Research. pamphlet 11. 1929, pp. 1-43, 1 plate (bionomics).

♂ Antennae short, subclavate, usually of nineteen segments, club apical, twice as wide as shaft, yellowish-brown; palpi with median segment relatively long and slender, more than twice as long as apical one; thorax dark fuscous; head, abdomen, and legs light fuscous; tuft of hairs on posterior tibiae very dense, light ochreous-brown in colour. Forewings hyaline, dark greyish-brown with a conspicuous intricate pattern of greyish-white lines obscured by ochreous and fuscous linear marks; beneath grey without pattern. Hindwings hyaline, dark grey, basal two-thirds of costal margin pale ochreous; ciliae white with darker transverse line, veins dark grey. Beneath with apex of wings densely, elsewhere more scantily pubescent. Expanse, 37 mm.

♀ Head, thorax, and abdomen slightly more fuscous than in male. Fore-

wings narrow and elongate, markings as in male but somewhat obscured. Hindwings rather uniformly dark grey, costa very narrowly ochreous. Expanse, 46 mm.

Loc. Tasmania: Scottsdale 1; Hobart 1; Snug River; Launceston 2. 19 males, 9 females.

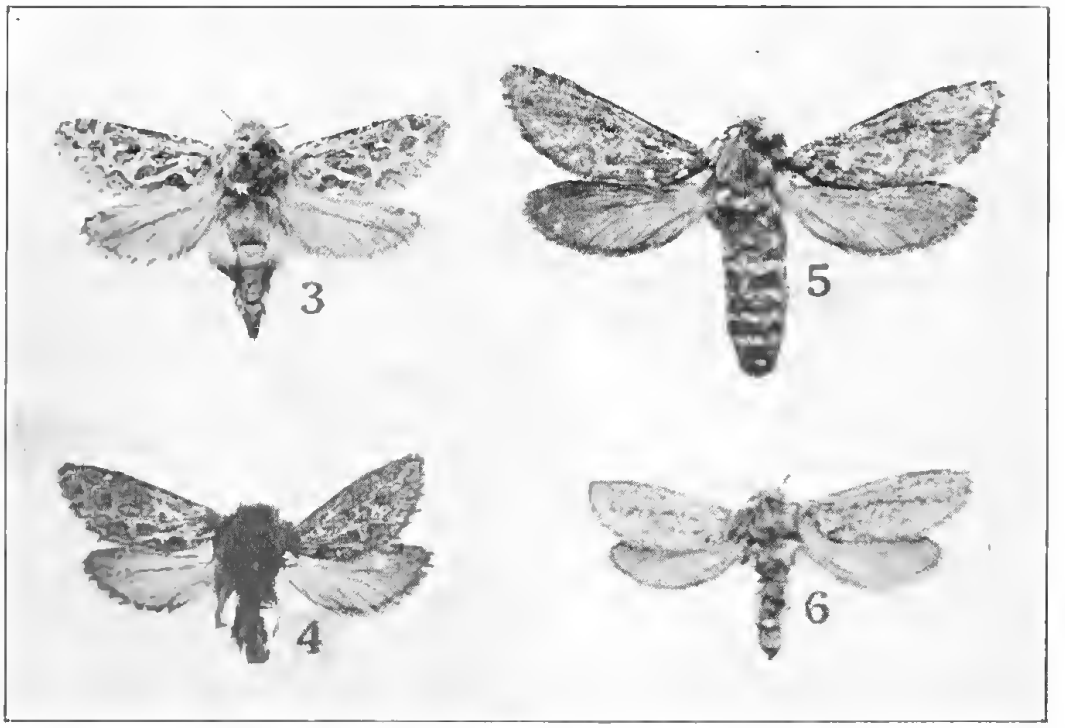

Fig. 3–6. *Oncopera intricata* (Walker). Left side: 3, male, Launceston; 4, type, a male, Tasmania (in British Museum). Right side: 5, female, Scottsdale; 6, female, Scottsdale.

The described male example (fig. 3) was taken at Launceston (February 7, 1902). It compares well with Walker's type example (fig. 4) in the British Museum. The latter came from Van Dieman's Land, and is one of sixteen examined by him. The female (Scottsdale, January 31, 1927) described and figured is of normal form and size (fig. 5); the other example is a dwarfed one taken at the same locality a year later (January 30, 1928).

The male genitalia have the vinculum wider than long, with the median process distinctly transverse. The tegumen has the caudal margin produced into a broad fold; the mesal processes are armed with sharp saw-like teeth. The harpe is without a sacculus, relatively broad, curved and rounded at apex; it is well clothed with specialized hairs, short at apex, stout at base. The 8th sternite is rectangular and without a spine or protuberance.

The genitalia figured by Eyer and Turner (Proc. Linn. Soc. N.S. Wales, l, 1925, pl. xxxii, fig. 1) may belong to this species, but the form of the tegumen and the spine-like anal process are not in close agreement with any examples examined. Dr. Turner has been unable to give me details of the provenance of their specimen.

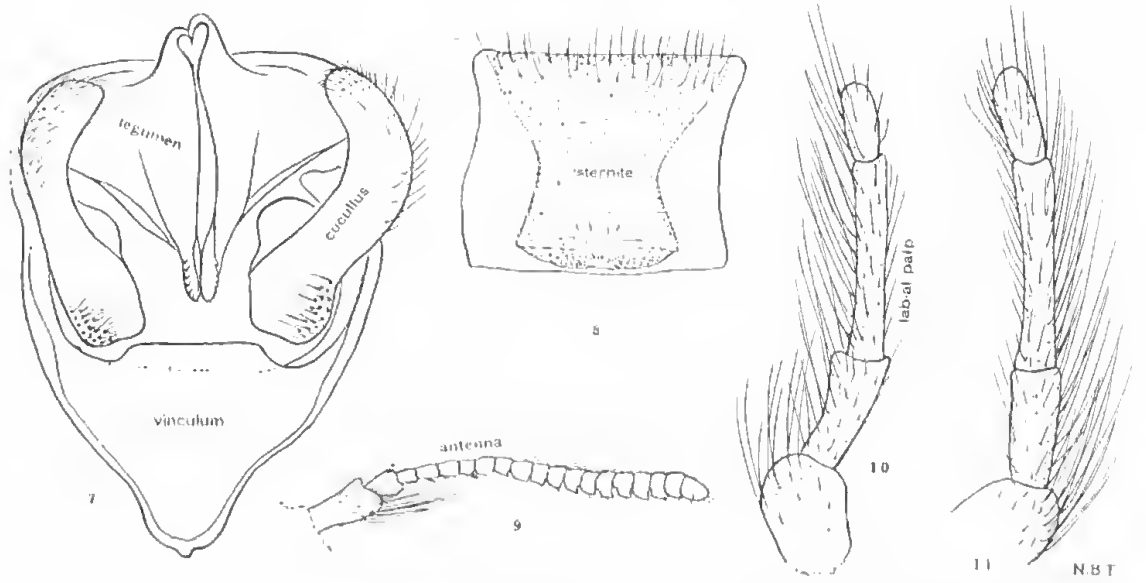

Fig. 7–11. *Oncopera intricata* (Walker). Scottsdale. 7, male genitalia; 8, eighth sternite; 9, antenna; 10–11, palpi showing range of variation.

O. intricata is readily distinguishable from all the other species of the genus by the broad vinculum of the male, with its transverse median process, also by the compactness of the tibial hair-tufts and the short, broad wings. The females have relatively long, narrow wings bearing marked traces of the male wing-pattern.

There is only one other known Tasmanian species, *O. rufobrunnea*, from which it is easily distinguished by its small size, short wings, and whitish reticulated markings.

This species is a serious pest of the grasslands of Tasmania. On mixed farming land it attacks permanent sown pastures, which normally become available in the second year after planting, and remain profitable for from eight to twenty years. Under the present conditions such pastures are depleted of their best grasses in the second and third years and are destroyed in the fourth.

The adult emerges between the last week of January and the middle of February. The life-cycle and the habits of the adults have been described by Hill, who has also published an account of experiments on methods of control.

ONCOPERA FASCICULATA (Walker).

Fig. 12-19.

Hepialus fasciculata Walker, Char. Undesc. Lep. Het., 1869, p. 68.
Oncoptera intricata Turner, Mem. Nat. Mus. Melb., 4, 1912, p. 18.

♂ Antennae subclavate, widest before apex, usually of 14–15 segments, apical segment slightly produced, palpi with median segment stout, less than twice as long as third, apical segment long. Head, thorax, abdomen, and legs ochreous-brown. Forewings bright opaque ochreous-brown with obscure darker infuscations; a submarginal white streak from near one-fifth inner margin bordered above with ochreous and below with black, forewing beneath ochreous-fuscous. Hindwings opaque, greyish-brown, with costa tinged ochreous from base to apex, beneath fuscous. Expanse, 44 mm.

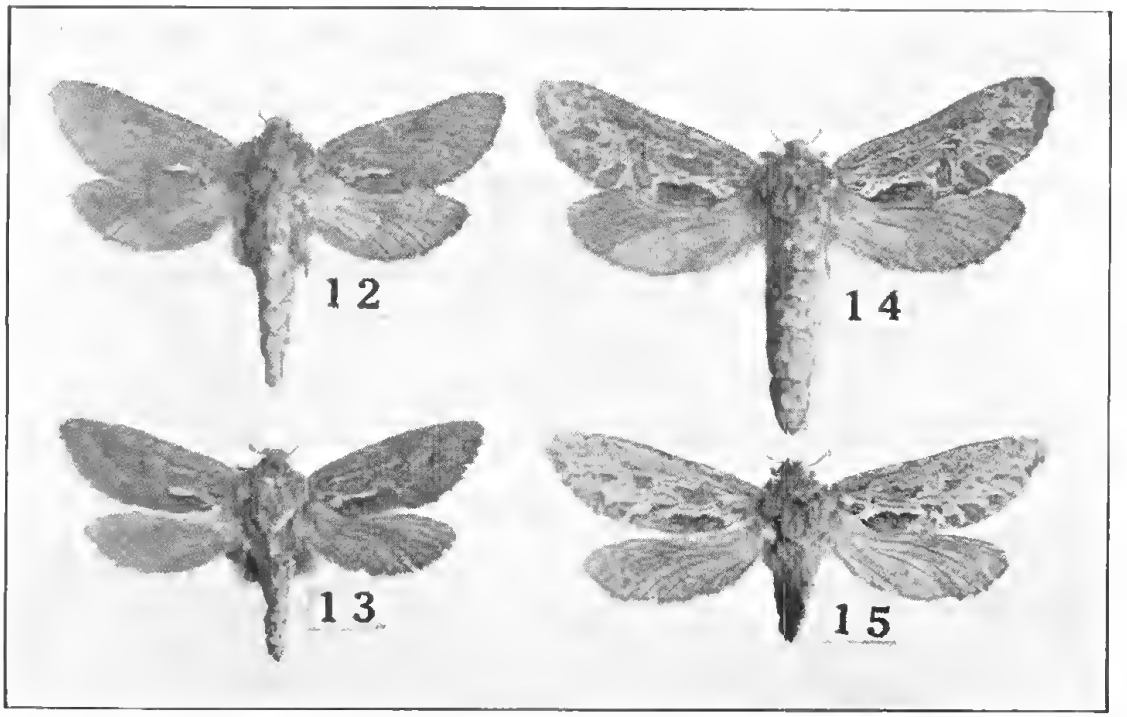

Fig. 12–15. *Oncopera fasciculata* (Walker). 12, male, Moe; 13, male, Gisborne; 14, female, Moe; 15, female, Gisborne.

♀ Head and thorax grey, abdomen slightly paler. Forewings opaque, obscurely brownish-black with a well-developed intricate pattern of ochreous marks margined with greyish-white; a conspicuous streak at one-fifth inner margin, as in male. Hindwings grey. Expanse, 50 mm.

Loc. Victoria: Moe 10; Gisborne 10; Leongatha 10; Caulfield; Melbourne; Packenham.

South Australia: Yahl Paddock near Mount Gambier 9. 50 males, 31 females.

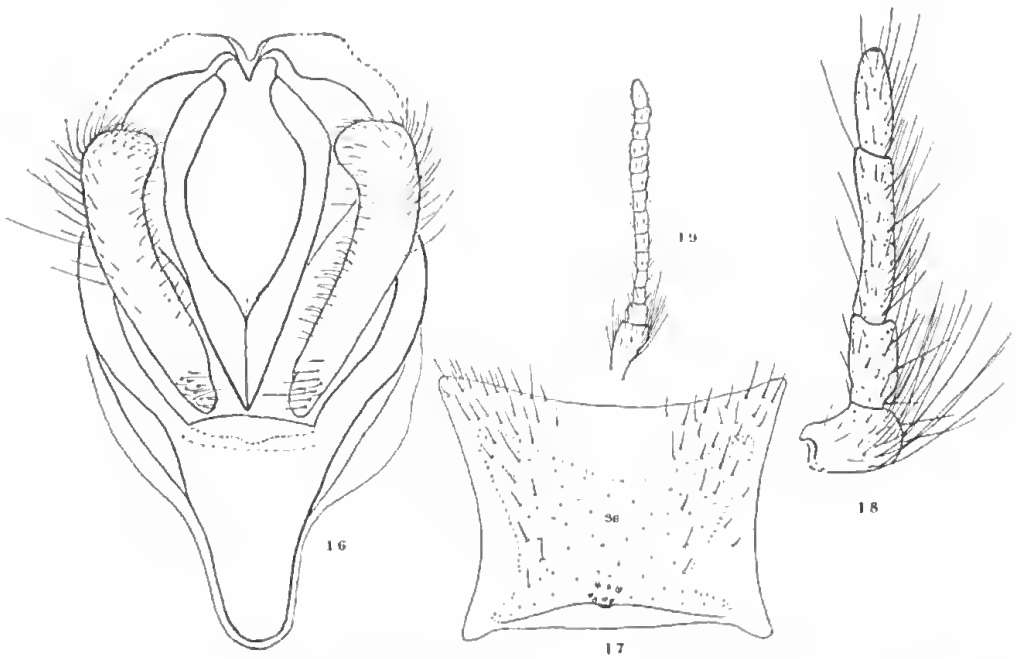

Fig. 16–19. *Oncopera fasciculata* (Walker). 16. male genitalia; 17. eighth sternite; 18, labial palp; 19, antenna.

The male and female examples described and figured are both from Moe (October 9, 1929), and are typical of long series from the same locality. Walker's type, in the National Museum, which is a male (not a female as described), agrees closely with the male described above. The other pair figured are from Gisborne (October 19, 1922, and October 11, 1895). The male is somewhat darker and female lighter than usual.

The male genitalia are characterized by the long, slender vinculum, somewhat variable, but often twice as long as wide; this bears a feebly convex median process. The mesal processes of the tegumen are broadly triangular and acutely terminated, without or at most with obsolete armature; in lateral view the mesal process is broad and strongly convex on posterior margin. The harpe is simple, the apex slightly swollen, truncated, and sub-rectangular, a slight swelling or carina may be present in the position of the sacculus of some other species of the genus. The juxta, usually not well chitinized, is apparently transverse in ventral view. The eighth sternite bears a small hollow protuberance. In two unlocalized examples, typical in general appearance, the vinculum is as wide as in normal *O. rufobrunnea*.

Mr. C. G. L. Gooding made systematic collections of this moth at Moe in October, 1929, and his results indicate that the first examples emerged on October 4. Males were then much more abundant than females. Males swarmed on the 7th and 9th. On the former night females were absent, or rare, but on the 9th they outnumbered the males. Isolated female examples were captured on the 12th and 15th, and males on the 16th. From this it appears that the emergence period is a limited one. At Gisborne, in 1895, females emerged on October 11, in 1922 males were taken abundantly on October 19 and sparsely on the 23rd.

One pair of this species in the Lyell collection bears erroneous date labels, indicating January 15, 1920, as the time of capture. Mr. Gooding, in 1928, suspected that he had made an error in dating these, and by intensive collecting proved that the January form from the same locality is a distinct species.

ONCOPERA RUFOBRUNNEA sp. nov.

Fig. 20-32.

♂ Antennae weakly subelavate, widest before apex, clothed with fine, scattered, semi-erect hairs, usually seventeen-segmented, ochreous-brown; palpi with second segment stout, third segment ovate. Head, thorax, and abdomen ochreous fulvous, tibial plumes somewhat lighter. Forewings hyaline, broad, dull reddish-brown with obscure darker infuscations, beneath grey. Hindwings grey, costal margin rather broadly ochreous. Expanse, 47 mm.

♀ Head, thorax, and abdomen fulvous. Forewings broad, hyaline, rather uniformly fulvous, with numerous small, obscure, darker marks. Hindwings hyaline, uniformly grey. Expanse, 57 mm.

Loc. New South Wales: Lee Creek, F.C.T., 11, 12. Moe 1, 11, 12 (January 18 and 16, 1930, C. G. Gooding, type, a male, and allotype female, I. 18670, in S. Aust. Mus.); Healesville 12; Leongatha 12; Hawthorn 11, 12; Dandenong Range 12; Toora 12; Gisborne 12; Geelong; Caulfield; Meeniyan 2. Tasmania: Tyenna 12; Hobart 12; Maria Island 12. 129 males, 41 females.

The type pair were taken in company with many others. The second pair figured are from Gisborne, captured on December 16, 1912. The wings of the Gisborne male are more ochreous in colour, the infuscations are less conspicuous, and the ochreous costal margin is broader. The female is lighter in colour. The third pair figured are Tasmanian; the male from Hobart in December, 1927, the female from Tyenna, December 8, 1929. The fourth pair shown are a very dark-coloured male from Moe (January 11, 1930) and a female from Hawthorn November 28, 1927). The latter emerged, before 7.45 p.m., from a buffalo-grass lawn.

The male genitalia have the vinculum longer than wide and posterior margin strongly and evenly convex. Tegumen with mesal processes blunt-pointed, armed with conspicuous medially directed acute denticles (fig. 29); the ventral margin

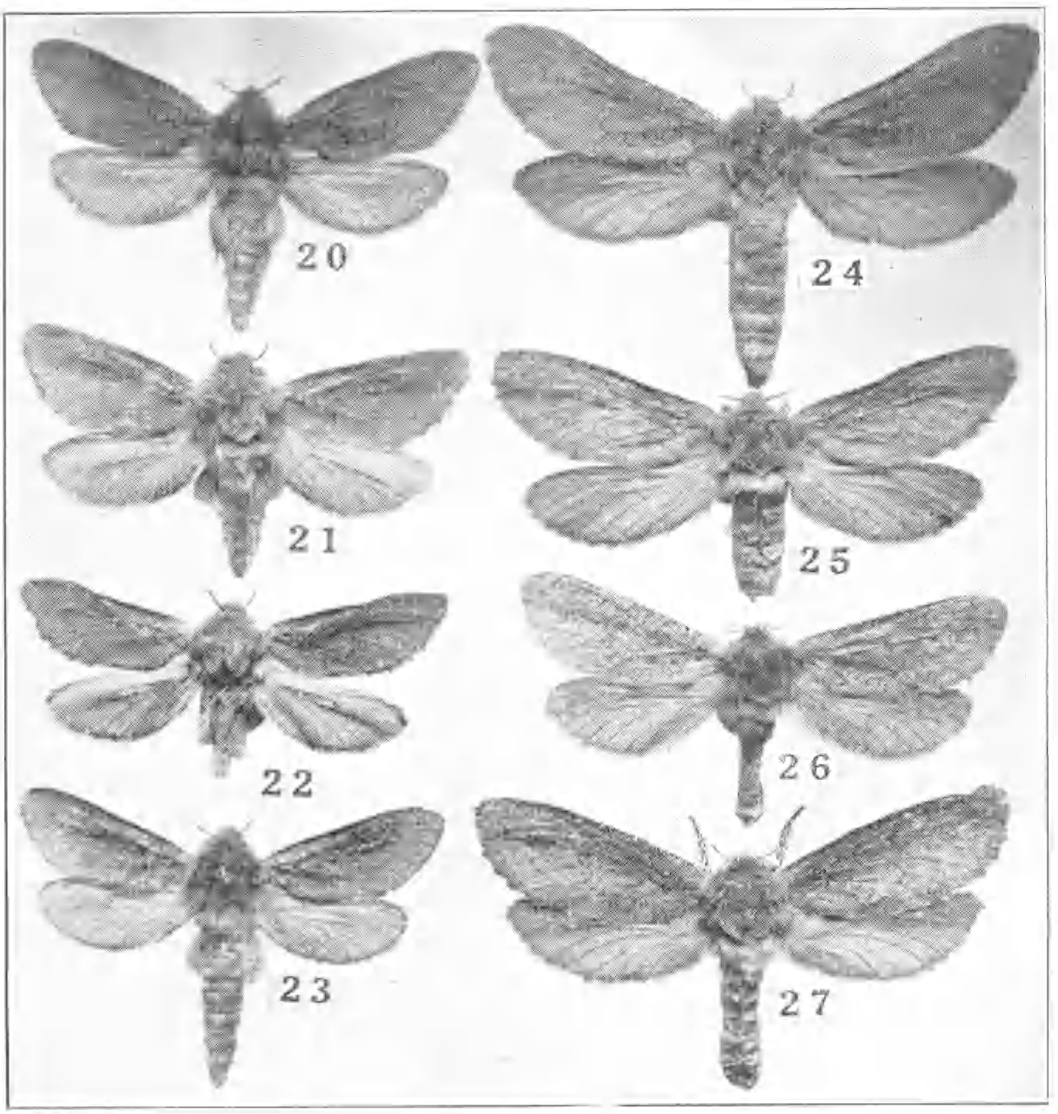

Fig. 20–27. *Oncopera rufobrunnea* sp. nov. 20. type, a male, Moe; 21. male, Gisborne; 22. male, Hobart; 23. male, grey form, Moe; 24. allotype female, Moe; 25. female, Gisborne; 26. female, Tyenna; 27. female, Hawthorn.

is well chitinized. Harpe in ventral view evenly curved, slightly swollen at apex, in lateral view broadly flattened towards base; juxta transverse; not well chitinized at lateral margins. The eighth sternite has the margin without or at most with an obsolete hollow protuberance.

One aberrant male example bears a small sacculus on one harpe; this is absent on the other valve. The genitalia figured are from an example from Hobart.

Mr. G. Lyell states that males of this species occasionally come to lights at night. The species is probably the most common one in eastern Victoria, and its range extends to Maria Island and Tasmania.

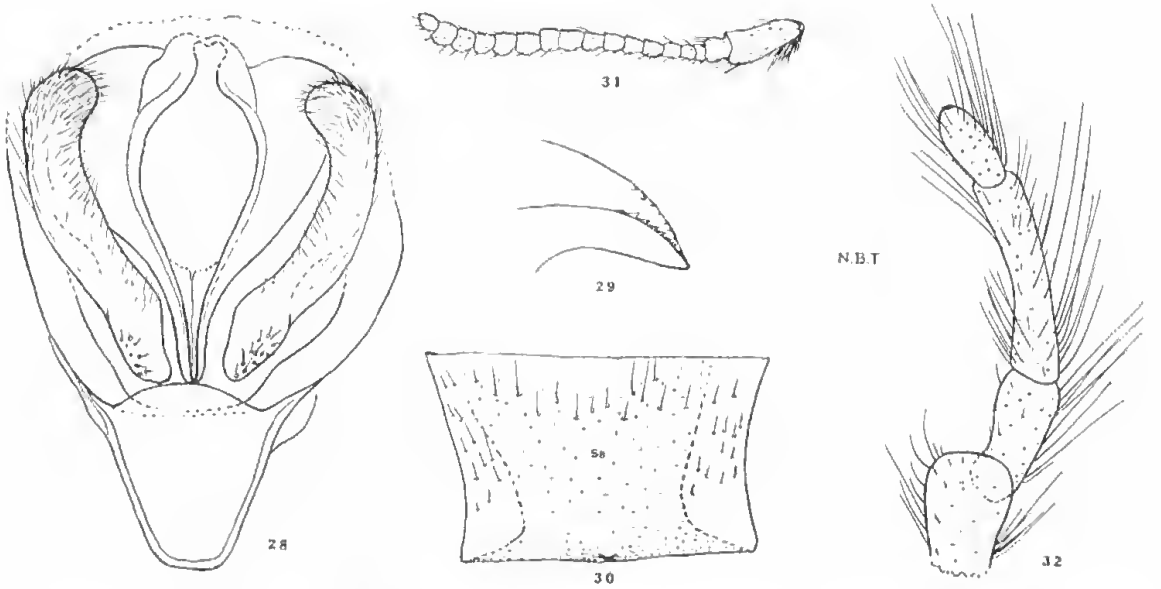

Fig. 28–32. *Oncopera rufobrunnea* sp. nov. 28, male genitalia, Hobart; 29, oblique view of tegumen; 30, eighth sternite, Moe; 31, antenna; 32, labial palp.

Mr. G. F. Hill reared both sexes of the species at Leongatha and Hawthorn. Several pupal shells have been examined, but owing to the absence of adequate comparative material have not yet been described. The mask may eventually be proved to give useful characters for the separation of the pupae of the different species.

ONCOPERA INTRICOIDES sp. nov.

Fig. 33-39.

♂ Antennae with club long compared with shaft, a very sparse clothing of sub-erect hairs, a basal tuft of very long hairs; usually composed of sixteen segments; apical segment twice as long as penultimate; palpi moderate, third segment long, truncated at apex, densely clothed with long hairs; head, thorax, abdomen, and legs dark-brown, tibial hair-tufts of posterior legs paler. Forewings rather broad, opaque, dark-brown with black scales, with irregular pattern of ochreous scales obscurely margined with greyish-white; traces of an irregular fascia near base of inner margin bordered posteriorly with black; beneath pale grey without pattern. Hindwings rather uniformly dark-brown except near apex. Expanse, 42 mm.

♀ Forewings rather broad, opaque, the pattern similar to male; the fascia near base of inner margin is somewhat less conspicuous. Hindwings greyish-brown, at costa narrowly yellowish; ciliae between veins tipped with dull white, at veins dark brown. Expanse, 56 mm.

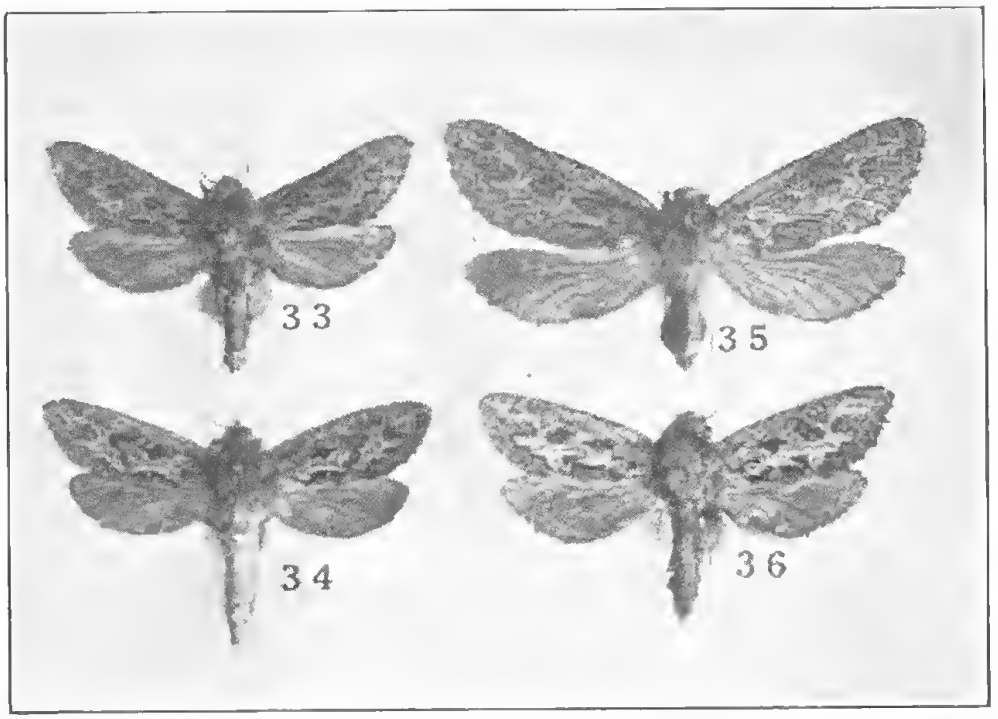

Fig. 33–36. *Oncopera intricoides* sp. nov. 33, type, a male, Moe; 34, male, Moe; 35, allotype female, Moe; 36, female, Moe.

Loc. Victoria: Moe 1, 11, 12 (December 28, 1920, C. G. L. Gooding, type, a male, and allotype female, I. 18671, in S. Aust. Mus.); Leongatha 12; Narracan 11; Caulfield; Toora 12. 25 males, 5 females.

The male genitalia have the vinculum longer than wide; the posterior margin is convex. The tegumen has the mesal processes narrow, long, and blunt-pointed, the ventral margin armed with moderately conspicuous acute denticles; the ventral margin is well chitinized. The harpe in ventral view is long and narrow, rather strongly curved and somewhat truncated at apex, a feeble ridge indicated by a line of hairs from base to two-thirds; juxta apparently transverse, posterior margin with a median notch. The figure of the genitalia is drawn from an example from Leongatha (December 15, 1927). In many examples the denticles of tegumen are absent from the margin for a short distance from the apex.

The type pair were taken together. Dates of capture of the series examined suggest that this insect is most abundant between December 15 and 30, and that

its emergence is limited to a few suitable nights during that period. Males continue to emerge in January, and at Moe in 1930 a series was taken on the 20th. In 1932 a male was captured at Moe as early as November 29.

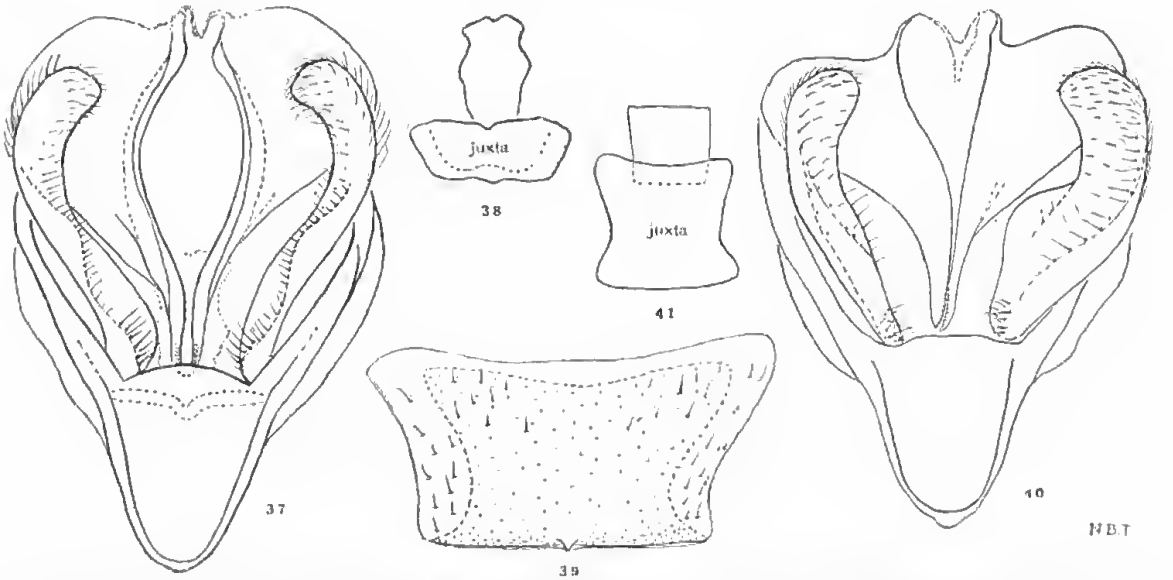

Fig. 37–41. 37–39, *Oncopera intricoides* sp. nov., male genitalia, Leongatha; 38, juxta and trullenm; 39, eighth sternite. 40 41, *O. alpina* sp. nov. 40, male genitalia; 41, juxta and trulleum.

The status of this form has been difficult to determine. Its range extends over part of that of *O. rufobrunnea*, it occurs at about the same season of the year and in the same general districts. It is much rarer than that species. Mr. C. G. Gooding considers that the larvae may be found to thrive under different soil conditions; he has noticed that some larvae occur on well-drained hillsides in sandy soil, others on the stiffer soil of the valley bottoms. In general appearance it is quite distinct from *O. rufobrunnea*. The abundantly marked wings, the submarginal fascia on hind margin of forewings, and the similarity of the sexes are well-marked characters, but the male genitalia indicate rather close relationship. The presence of a marked protuberance on the eighth sternite is a distinct difference; in *O. rufobrunnea* this is normally absent, but in a long series intergradations may occur, for there is an example in the series with a small but distinct process. An aberrant example from Moe (November 29, 1932) has the vinculum divided by a rounded anterior notch into two lobes.

ONCOPERA ALPINA sp. nov.

Fig. 40-47.

♂ Antennae short, clubbed, usually of fifteen segments, clubbed portion long, one and a half times as wide as shaft, apical segment small, as wide as long;

ochreous, densely clothed with flattened scale-like hairs. Palpi stout, median segment two and a half times as long as third, the latter sub-rectangular and more than twice as long as wide. Head, thorax, abdomen, and legs dark brown. Forewings opaque, dark brown with darker suffusions; a well-defined, irregular pattern of pale ochreous marks bordered with darker ochreous and creamy-white scales, sub-marginal fascia near base of inner margin well developed. Ciliae ochreous, at veins dark brown; wings beneath clothed with uniform grey hair like scales. Hindwings greyish-brown, costa from base to apex pale ochreous; ciliae pale ochreous, at veins greyish-brown. Expanse, 38 mm.

♀ Antennae similar to male, pale ochreous; head, thorax, abdomen, and legs pale ochreous-grey. Forewings dark grey with greyish-white pattern similar to that of male. Hindwings grey, paler near base. Expanse, 41 mm.

f. nebulosa form nov. Similar to typical form. Forewings dull ochreous-brown with the markings obscured. Hindwings as in typical form. Expanse, 38 mm.

Loc. New South Wales: Mount Kosciusko 12 (December 7, 1922, G. M. Goldfinch; type, a male, in Goldfinch collection; allotype female, at 5,000 feet, December 3-10, 1921, I. 18672, in S. Aust. Mus.). 8 males, 1 female.

f. nebulosa. Mount Kosciusko, 5,000 feet, 12 (type, a male, I. 18673, in S. Aust. Mus.). 3 males.

The series examined were all taken by Messrs. G. M. Goldfinch and A. J. Nicholson at 5,000 feet on Mount Kosciusko, between December 3 and 10, 1921, and on December 7 of the following year.

Associated with the typical examples were several males with the forewing markings obscured and suffused with ochreous-brown, thus resembling in general appearance dwarfed examples of *O. rufobrunnea*. In the structures of the genitalia they agree closely with typical *O. alpina*, and can therefore be treated only as a form or variety.

Mr. Goldfinch writes with regard to this species: "I have no doubt that the various forms represent only one species. They were all taken at the lights on the verandah of the hotel, but I have found examples hiding for shelter under bark and logs in cold weather. Empty pupal cases which, I have little doubt, belong to this species are not infrequently seen projecting from tufts of snow grass."

The male genitalia have the vinculum longer than wide; the posterior margin is transverse or very slightly rounded. The tegumen has the ventral margin unfolded and relatively lightly chitinized, the downward tilt of the posterior portion, as viewed from the ventral aspect, causes it to appear like an anal spine or process; the mesal processes are blunt-pointed and armed with conspicuous marginal acutely-pointed denticles. The harpe is without a sacculus and is relatively

broad and evenly curved; the apex is slightly inflated and truncated. The juxta is as wide as long; the lateral margins are concave. The trulleum is rectangular.

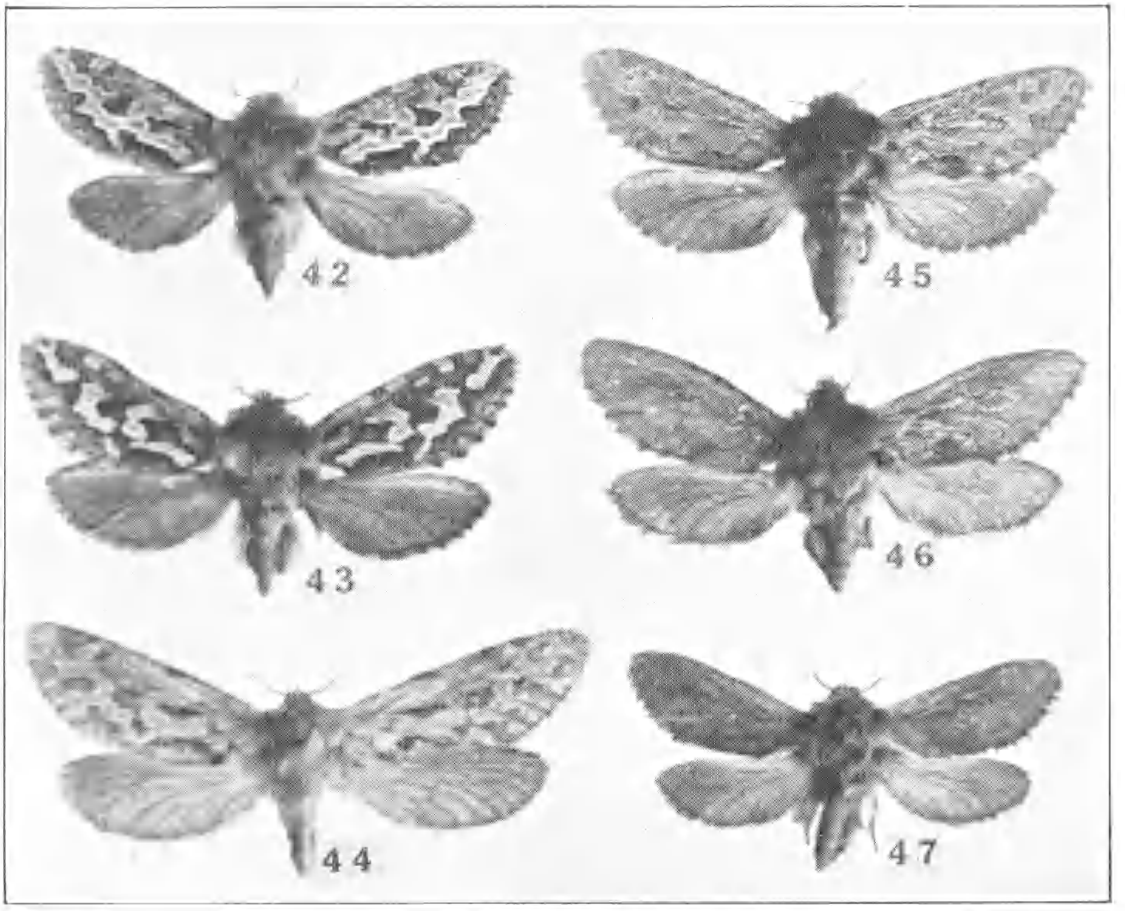

Fig. 42–47. 42–44. *Oncopera alpina* sp. nov. 42. male; 43. type, a male; 44. allotype female. 45–47. *O alpina* f. *nebulosa* form nov. 45. type, a male; 46–47. males, Mt. Kosciusko.

The genitalia figure is drawn from the type example. Eyer and Turner's figure (*loc cit.*, pl. xxxii, fig. 1), ascribed to *O. intricata*, may have been based on an example of this species. The posterior portion of the tegumen appears from certain aspects to be like a true anal process. Dr. Turner has been unable to trace details as to the locality of his dissected specimen, so that the matter is inconclusive.

The species differs from *O. intricata* in the form of the vinculum of the male and in the colour of the body and wings. From *O. rufobrunnea* it is distinguished by the presence of a marked submarginal fascia near base of inner margin. From male *O. intricoides* it differs in the smaller size, the varicoloured ciliae of hind-wings, and the form of the juxta and tegumen. The female *O. intricoides* is larger and has broader wings.

ONCOPERA (PARONCOPERA) ALBOGUTTATA sp. nov.

Fig. 48-60.

Oncopera mitocera Turner, Proc. Linn. Soc. N.S. Wales, I, 1925, p. 272, pl. xxxii, fig. 2 (*nec* Turner, 1911).

♂ Antennae short, not markedly clubbed, brown, usually eighteen-segmented, a long tuft of hairs at base. Head, thorax, and legs brown, abdomen greyish-brown. Forewings pointed, almost subfalcate, pale brown with small

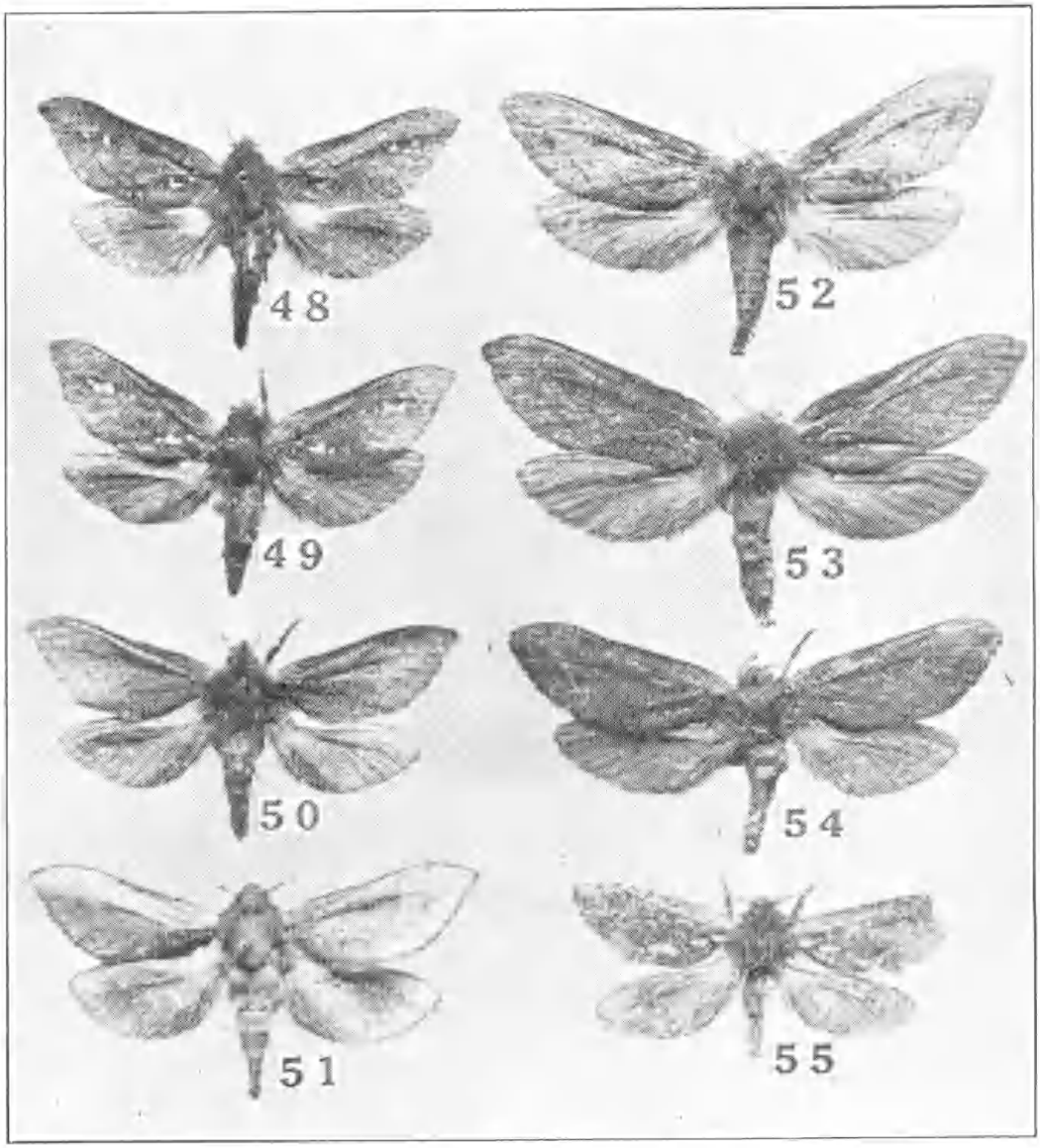

Fig. 48–55. *Oncopera alboguttata* sp. nov. 48. type, a male, Killara; 49. male, Killara; 50. male, reddish ochreous form, Killara; 51. male, National Park, Queensland; 52. allotype female, Killara; 53. female, Killara; 54. female, Killara; 55. male, National Park, Queensland.

irregular spots of darker colour; a group of three submarginal greyish-white spots near one-third inner margin partly surrounded by black scales, a group of two similar discoidal spots near base of M_1; beneath grey. Hindwings grey, apex broadly and costa narrowly brown as on forewings, base white. Expanse, 40 mm.

♀ Forewings less acute at apex than in male, termen strongly rounded, pale brown with very scattered darker flecks. Traces of markings near one-third inner margin, also indications of subterminal and discoidal dark brown marks. Hindwings as in male, base of wings dull greyish-white. Expanse, 48 mm.

Loc. New South Wales: Killara 2 (February 12, 1928, G. A. Waterhouse, type, a male, and allotype female, February 26, 1928, I. 18674, in S. Aust. Mus.); Ash Island; Deer Vale 1; Dorrigo 1, 2. Queensland: National Park (3,000 feet) 1, 12. 23 males, 7 females.

The pair described above are very typical. Both sexes are variable. Fig. 50 depicts a male example from Killara (February 12, 1928), taken with the type, in which the markings are almost obsolete and the head, thorax, and forewings are bright reddish-ochreous. Such ruddy examples are common at Dorrigo. In other male examples (fig. 51) the ground colour remains as in the typical form, but the white marks become obsolete. Some females (fig. 53-54) are heavily infuscated; in such cases the tiny fleck-like spots may stand out as dark-centred brown ocelliform marks.

Male genitalia with vinculum longer than wide; the marginal and less heavily chitinized portion sometimes broad; posterior margin strongly and evenly convex. Tegumen with mesal processes blunt-pointed, armed with conspicuous rounded denticles, which continue along ventral margins of tegumen to one-half; anal portion strongly chitinized, appearing as a rounded prominence. Harpe long and curved, outer margin somewhat irregular, sacculus absent; a well-chitinized saccular lobe at one-half. Juxta as wide as long, lateral margins concave. Eighth sternite longer than wide, the posterior extremity narrowed and strongly chitinized as a blunt process.

The genitalia figure was drawn from an example taken in the National Park, Queensland, in January, 1928. Dissections show that the posterior margin of the vinculum in this species is evenly convex and that the eighth sternite is produced into a blunt posterior process. This latter feature was interpreted as a "prominent median process" of the vinculum by Eyer and Turner (*loc cit.*, p. 272).

The species was taken by Scott at Ash Island many years ago, but the specimens remained undescribed. Dr. G. A. Waterhouse, who captured it in his garden at Killara on February 12, 1928, writes: "I was out at the back of my house just at dusk, and saw numbers of the *Oncopera* flying at one spot. I caught

one and . . . saw that it was not the common Hepialid. For the next week I was not at home or it was raining very hard. . . . After I had set the others [on February 22 and 26] I caught two which I think are the females of the same species." In 1929 he wrote: "Last year on the day I collected the eight specimens . . . they were exceedingly common, and I caught them all within a few minutes. . . . This year they are almost absent. On 17th February, with Goldfinch, we got two only, and may have seen another two. On the 19th February, though I waited from just before dusk until dark, I saw none. On the 22nd I caught the only two examples seen. On the 24th I caught one and may have seen another. They are not on the wing until 6.30 p.m., and it becomes too dark to see them after 7 p.m."

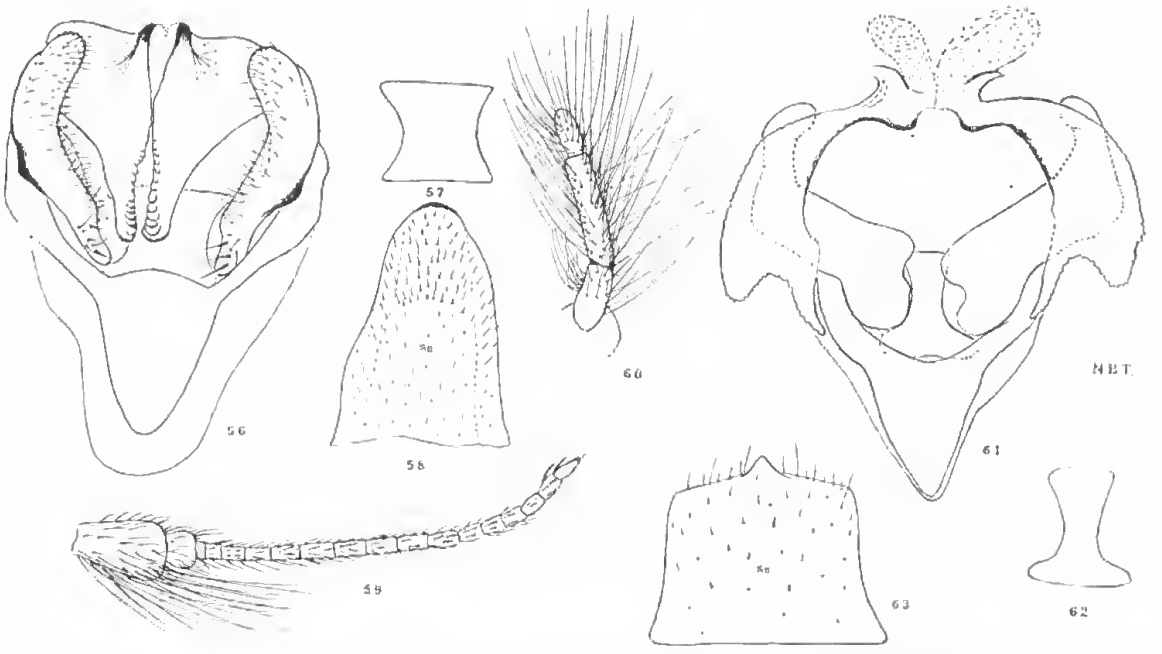

Fig. 56–63. 56–60, *Oncopera albaguttata* sp. nov. 56, male genitalia, National Park, Queensland; 57, juxta; 58, eighth sternite; 59, antenna; 60, labial palp. 61–63, *Oncopera brunneata* sp. nov. 61, male genitalia, Mt. Tomah 62, juxta; 63, eighth sternite.

Turner apparently sent Queensland National Park specimens of this species to Eyer under the name *O. mitocera*. Examination of the type of the latter has since shown that the present species is a distinct one, and that true *O. mitocera* has a well-defined saeculus somewhat similar to that of *O. epargyra*.

In the form of the wings this species is related to *O. epargyra*. The white base to the hindwings links it with *O. brachyphylla*, from which it differs markedly in wing-form and in the absence of saeculus in the male. By the latter character it is allied to the southern *O. intricata* group of species, but differs from

all of them in the form of the genitalia, wings, and antennae. The life-history is quite unknown.

ONCOPERA (PARONCOPERA) BRUNNEATA sp. nov.

Fig. 61-65.

♂ Antennae short, not clubbed, relatively smooth, a marked tuft of hairs at base. Head and thorax greyish-brown; legs greyish-brown, posterior pair ornamented with tufts of long bright ochreous hair. Forewings short, broad, R_1 and R_5 branching well before radio-median cross-vein, brown with numerous black scales, an oblique ochreous-brown fascia from near apex to two-thirds inner margin, obscure pale brown markings along costa, termen with obscure ochreous

Fig. 64–65. *Oncopera brunneata* sp. nov. 64, paratype male, Mt. Tomah; 65, allotype female, Ebor.

suffusion, traces of ochreous blotches near base of wing, beneath uniformly grey. Hindwings rather uniformly grey, costa near apex rather narrowly barred with paler grey; beneath with apical third grey, posterior part of wing clothed with specialized silvery-white scales. Expanse, approx. 33 mm.

♀ Antennae as in male. Head, thorax, and legs pale greyish-brown. Forewings rather long and narrow, grey with a few obscure darker scales, no definite traces of pattern. Hindwings uniformly grey; beneath grey; no traces of silvery scales of male. Expanse, 35 mm.

Loc. New South Wales; Mount Wilson 1 (type, a male, January 11, 1929, A. J. Nicholson, I. 18675, in S. Aust. Mus.); Mount Tomah 12; Ebor 12 (December 27, 1911, R. J. Tillyard, allotype female, in Lyell coll.). 2 males, 1 female.

The dates of capture range from December 27 to January 11. The female from Ebor is worn, and as it was not taken with the male is associated with some

slight hesitation. In its diminutive size and in the form of the antennae it agrees quite well with the other examples.

The male genitalia have the vinculum wider than long, markedly V-shaped, with the posterior margin somewhat concave. The tegumen has the ventral margin (shown in lateral view in the figure) undulate and produced into a large rounded lobe. The harpe is long, dilated, especially near base, sharply angled at one-half, and inflated at apex. The juxta is in the form of an inverted T, and is longer than wide. The eighth sternite is as long as wide, and is armed with a conspicuous median process.

The possession of a process on the eighth sternite links this species with *O. mitocera*, from which it is otherwise distinct. The presence of specialized dense silvery-white scales on the posterior half of the underside of the hindwings allies it with *O. argentata* and *O. parca*, from both of which it is distinct in the presence of an oblique fascia from near apex to two-thirds inner margin.

Mr. G. M. Goldfinch has taken an example of this species, and has forwarded the following notes: "Mounts Wilson and Tomah . . . are only a few miles apart, and both are capped with basalt. The country is a rain forest area. The males fly at a great rate two or three inches above the ground in the scrub clearings, at late dusk, and are most difficult to see and catch. One is aware that something dark is flying. . . . I noticed that the specimen I finally caught had a definite track past the base of a small tree, and after several unsuccessful attempts secured it."

ONCOPERA (PARONCOPERA) BRACHYPHYLLA Turner.

Fig. 66-72.

Oncopera brachyphylla Turner, Proc. Linn. Soc. N.S. Wales, 1, 1925, p. 273, pl. xxxii, fig. 3.

♂ Antennae not clubbed, dark brown, smooth, a conspicuous tuft of hairs from base, apex acute. Head, thorax, and legs brown, posterior pair paler, with moderately developed ochreous tibial hair-tuft; abdomen greyish-brown. Forewings short, broad, with R_1 and R_5 branching just before radio-median cross-vein, brown with some scattered black scales; an irregular white discal mark at two-thirds, connected by an oblique white fascia with three-fourths inner margin; traces of a subterminal grey line at one-half, internal to which there is an irregular black blotch; beneath uniformly dull brown, costa narrowly tinged ochreous. Hindwings, except at base, uniformly brown above and below, base obscured dull white. Expanse, 35 mm.

♀ Unknown.

Loc. Herberton 1, 2; Evelyn Scrub 2; Kuranda; Cairns district. 12 males.

The described male example (fig. 67) is one from Evelyn Scrub, February, 1911. A second example (fig. 66) has the forewings uniformly ochreous-brown with the white markings obsolete. In a third the white markings are also obsolete, but the apical half of the wing is obscurely and irregularly blotched with paler ochreous scales (fig. 68). In a fourth the ground-colour is paler ochreous-brown, with a broad irregularly-defined silvery-white streak from base to near one-half inner margin and a narrow discal streak from near base to three-fourths, where it is expanded to form an irregular blotched mark (fig. 69). An example of the type series from Evelyn Scrub has also been examined. The genitalia have been detached from this specimen, so that it is probably the one studied by Eyer.

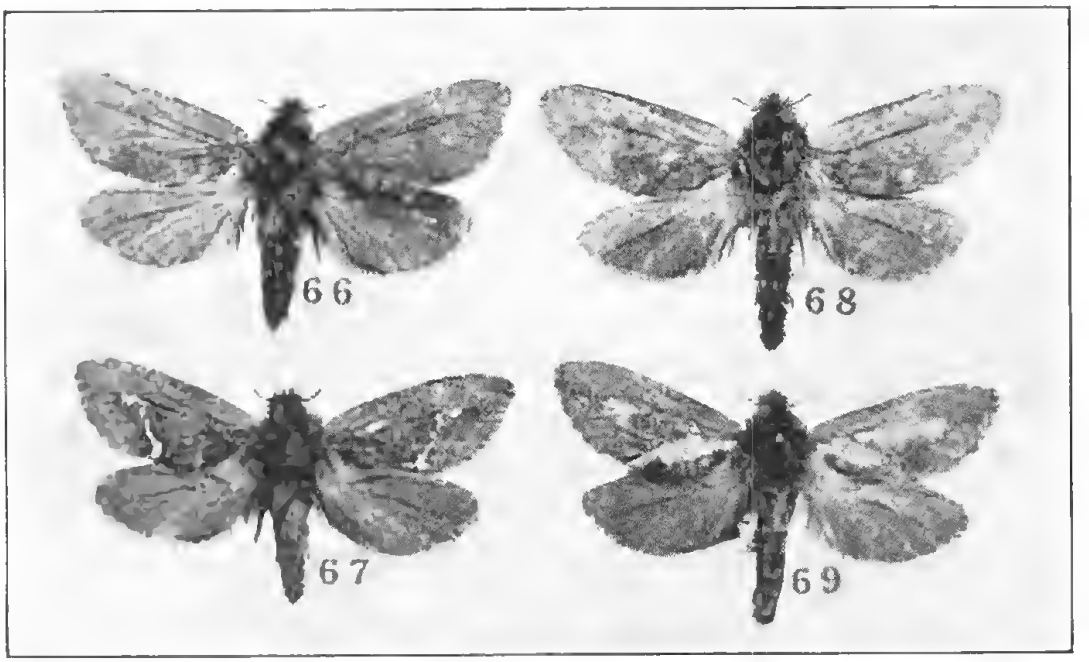

Fig. 66–69. *Oncopera brachyphylla* (Turner). 66, male, Herberton; 67, male, Evelyn Scrub; 68, male, Herberton; 69, male, Kuranda.

The male genitalia have the vinculum long and narrow, with the thinner lateral parts poorly developed; the posterior margin is slightly convex. The tegumen has long, unarmed mesal processes. The harpe is long and slender, has a narrow base, a short blunt sacculus, and a long curved cucullus. The juxta is wider than long, the anterior margin transverse, the other margins concave. The eighth sternite is about as wide as long, with the posterior margin strongly concave.

The short, broad wings and compact form of this species is characteristic; in this respect it shows some relationship to large examples of *O. parva* and to *O.*

argentata. It also resembles these two species in the unarmed margin of the tegmen with its long mesal process, but differs from them in possessing a reduced sacculus. From both of them it may also be distinguished by the uniformly brown hindwings and the absence of the specialized white scales beneath.

The late Mr. A. M. Lea found this species flying in the twilight of the rain forest before dusk. The type specimens were taken by Mr. F. P. Dodd in the Evelyn Scrub. It seems possible that the larvae recorded by Atherton as feeding on fallen leaves (see reference under *O. mitocera*) may belong to this species. He says:

"Larvae in the rain forest live in burrows with unprotected entrances. Here they feed on fallen leaves, in particular those of the strangling fig (probably *Ficus Watkinsonii*). These fallen leaves, though yellow to some extent, are usually succulent for some time after they fall to the ground; but dry leaves and even soft wood may be taken by the insect."

ONCOPERA (PARONCOPERA) PARVA sp. nov.

Fig. 73-76, 79-81.

♂ Antennae short, slender, smooth, not clubbed, a tuft of short hairs from base. Head and thorax pale brown, legs paler, posterior pair with long, well-developed tibial hair-tufts. Forewings slightly pointed at apex, R_4 and R_5 branching at radio-median cross-vein, pale brown with ochreous and creamy-white scales forming an obscure suffusion along costal margin and on apical third of wing. Hindwings greyish-brown, costa and apex rather broadly creamy-white; beneath with apical third dull brown, posterior two-thirds and base clothed with dull white scales. Expanse, 30 mm.

♀ Antennae short, dark brown; head, thorax, and abdomen dull fulvous. Forewings relatively long and narrow, dull greyish-brown with some paler scales, pattern obsolete. Hindwings pale brown, costa narrowly cream, beneath uniformly pale brown. Expanse, 34 mm.

Loc. Queensland: Cairns district (A. M. Lea, type, a male, and allotype female, I. 18676, in S. Aust. Mus.). 3 males, 1 female.

Two males and a female were taken together by the late Mr. A. M. Lea. The female example is rather worn. A third male (fig. 81), from the Lower collection, is larger (35 mm.), and differs from the typical form in possessing a broad creamy-white mark parallel to hind margin and extending to one-half, also a narrower discal streak from near base to three-fourths, and a rounded yellow spot at two-thirds inner margin. The posterior wings are similar to the typical form.

The male genitalia have the vinculum somewhat broad and the posterior

margin convex. The tegumen has the mesal processes relatively long, slender, and unarmed; in lateral view they are only slightly angled at their juncture with main body of tegumen. The harpe is long and narrow at the base, the sacculus is long and acute, the cucullus strongly angled at two-thirds. The juxta is subrectangular and longer than wide.

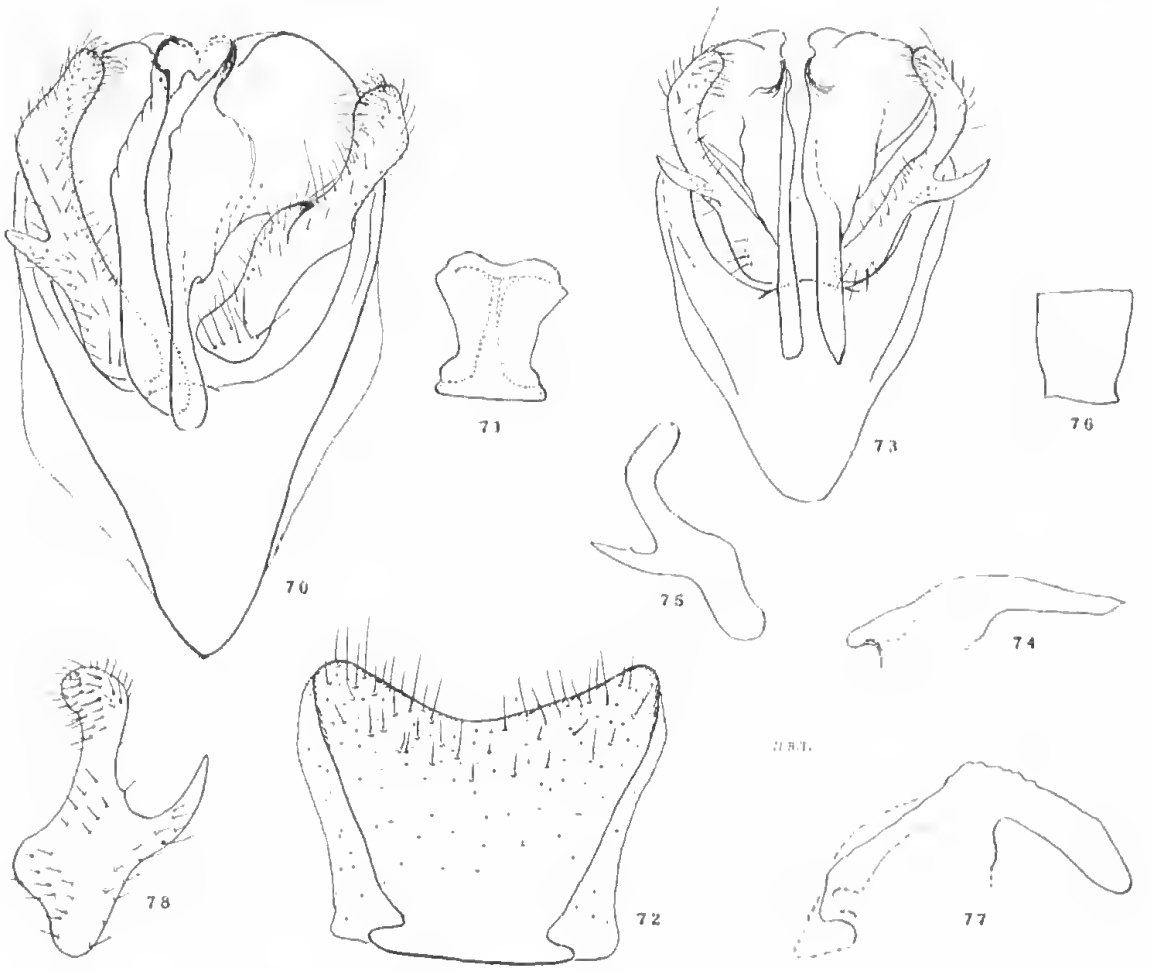

Fig. 70–78. 70–72 *Oucopera brachyphylla* (Turner). 70, male genitalia; 71, juxta; 72, eighth sternite. 73–76 *O. parva* sp. nov. 73, male genitalia; 74, lateral aspect of portion of tegumen; 75, harpe; 76, juxta. 77–78, *O. argentata* sp. nov. 77, lateral aspect of portion of tegumen; 78, harpe.

This species resembles *O. brunneata* in the underside of the hindwings and in the form of the wings of the female, but differs widely in the form of the male genitalia and in wing markings. From *O. brachyphylla* it is distinct in the long, slender mesal processes of tegumen, the long sacculus, rectangular juxta, and in the presence of specialized dull white scales on the underside of the hindwings. From the next species (*O. argentata*) it differs in the proportions of the harpe and in the absence of silvery-white scales on the base of the hindwings.

The exact localities of the types of this and the following species were not indicated by the late Mr. A. M. Lea, all the insect material he collected during his visit to North Queensland in the year 1912 being labelled simply "Cairns District." This obscures the relationship between the warm temperate fauna of the highlands and the coastal tropical species which he then collected.

The following principal collecting dates and locations may serve ultimately as clues to the real distribution of some of the species:

Cairns: February 12-13, 19-20; March 16-17, including attempts to visit Green Island; March 29. Very little collecting was done.

Kuranda: February 14; March 11-13; small collections only.

Nelson: February 15-19; March 14-15, 18-20, 28. Large collections.

Atherton: February 21-26. Abundance of insects of all kinds.

Tolga: February 26. Brief visit.

Malanda: February 26 to March 1. Good collecting.

Yungaburra: March 2. Brief visit.

Chumbrumbra: March 3. Brief visit.

Peeramon: March 4-5. Brief visit.

Kulara: March 6-7, 9-10. Extensive collections.

Sharp's Siding (Yungaburra): March 7-8. Good collections.

Harvey Creek, at base of Belenden Ker: March 20-27. Large collections.

Edge Hill, near Cairns: March 30. A brief visit only.

ONCOPERA (PARONCOPERA) ARGENTATA sp. nov.

Fig. 77-78, 82.

♂ Head and thorax ochreous-brown. Forewings with R_4 and R_5 branching just before radio-median cross-vein, dull brown, costa near base pale ochreous with traces of brown spots near apex, whole of discal region from base to three-fourths clothed with specialized cream-tinged silvery-white scales; beneath uniformly dull brown. Hindwings dull brown, apex broadly, termen and veins narrowly pale ochreous, discoidal region narrowly and base broadly clothed with silvery-white scales; beneath with costal third dull brown, posterior portion dull white. Expanse, 36 mm.

Loc. Queensland: Cairns district (A. M. Lea, type, I. 18677, in S. Aust. Mus.). 1 male.

The male genitalia are somewhat similar to those of *O. parva*; the harpe has the base very broad, the sacculus almost as long as cucullus; the cucullus short, bent, and inflated at apex. The mesal processes of tegumen are unarmed; in lateral view they are strongly angled at junctnre with main body of tegumen.

In the form of the male genitalia this species appears to be most nearly related to *O. epargura*, but it differs from the published figure and description in possessing an apically dilated cucullus. The form of the median process of the tegumen also appears to be different.

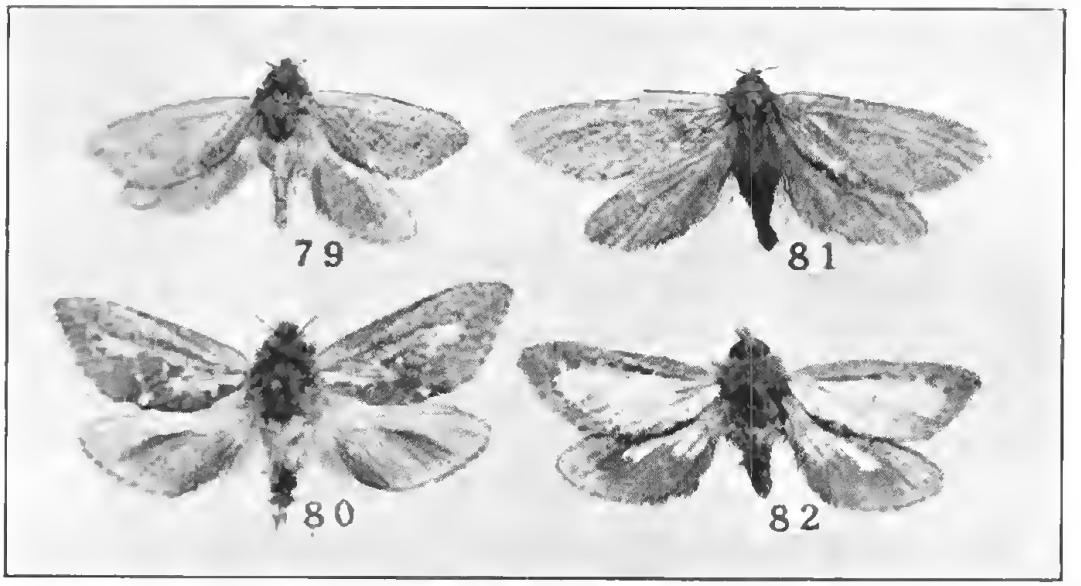

Fig. 79–82. 79–81, *Oncopera parva* sp. nov. 79, type, a male, Cairns district; 80, allotype female, Cairns district; 81, male, Cairns district. 82, *O. argentata* sp. nov. type, a male, unique, Cairns district.

At first sight it is very close to *O. parva*, but the different harpe, stout, bent mesal process of tegumen, and the silvery-white scales on hindwings are distinctive.

ONCOPERA (PARONCOPERA) EPARGYRA TURNER.

Oncopera epargura Turner, Proc. Linn. Soc. N.S. Wales, l, 1925, p. 273, pl. xxxii. fig. 4.

"Valves with sacculus narrow and acutely pointed, almost as long as cucullus, cucullus less broad than in *brachyphylla*, not dilated apically; eighth sternite shuttlecock-shaped, upper angles projecting; vinculum broad, not emarginate, without median process; aedeagus a somewhat oval plate."

Loc. Queensland: National Park, 3,000 feet) 12.

This species was described from two examples taken in the National Park, Queensland. The type has not been examined, but Dr. Turner has kindly forwarded the second specimen for study. This unfortunately proves to belong to a different species (*O. alboguttata*), in which there is no sacculus. Eyer and Tur-

ner's figure and the description of the genitalia in their key (*loc. cit.*, p. 272) should be sufficient to determine the species when further material is available.

ONCOPERA (PARONCOPERA) MITOCERA (TURNER).

Fig. 83-92.

Oncoptera mitocera Turner, Ann. Queensl. Mus., 1911, p. 132.
Oncopera mitocera Aurivillius, Arkiv. f. Zool., Stockholm, 13 (2), 1920, p. 43.
Oncopera mitocera ab. *suffusa* Aurivillius, *loc. cit.*
Oncopera mitocera ab. *fincata* Aurivillius, *loc. cit.*
Oncopera mitocera ab. *villata* Aurivillius, *loc. cit.*
Oncopera mitocera Philpott, Trans. New Zeal. Inst., 57, 1926, p. 725, fig. 15 (maxilla).
Oncopera epargyra Philpott, Trans. Ent. Soc. Lond., 75, 1927, pl. 1, fig. 9 (genitalia).
Oncopera mitocera Atherton, Grass pests of the Atherton tableland, pamphlet, 8 pp., Dept. Agriculture, Queensland, Nov., 1931, p. 5 (bionomics).

♂ Antennae short, slender, not clubbed, clothed with flat scale-like hairs, a tuft of long hairs at base, usually twenty segments. Head, thorax, and legs ochreous-brown, abdomen darker. Forewings with R_4 and R_5 branching at radio-median cross-vein; brown with obsolete traces of a subterminal oblique fascia from disc to two-thirds inner margin. Hindwings grey, apex paler, costa narrowly ochreous, beneath grey near apex, base and portion of posterior half of wing with dull white specialized scales. Expanse, 44 mm.

♀ Head, thorax, and legs dull ochreous brown. Forewings pale ochreous with darker brown scales forming an obscure pattern. Hindwings dull greyish-brown, at apex irregularly paler, giving a dappled effect; wings below uniformly dull brown. Expanse, 53 mm.

Loc. Queensland: Kuranda 4 (type, a male, April, 1907, in Turner coll.); Herberton 2; Cairns. 25 males, 11 females.

Dr. Turner's type example has been described and figured. The second male specimen differs in possessing a dull white subterminal fascia somewhat expanded in discoidal region, and an equally well-defined white streak nearly parallel to the inner margin and extending from the base to the subterminal fascia. The female described was taken by Mr. F. P. Dodd at the same place as the type, in April, 1910. The second female is an example from Cairns in the MacLeay Museum. It is of a somewhat duller brown than the first one, and may possibly not belong to the species; it differs in that R_4 and R_5 branches well after the radio-median cross-vein.

The male genitalia have the vinculum strongly V-shaped; the thinly chitinized marginal parts are broad; the posterior margin slightly concave. Tegumen with ventral margins inflated, strongly armed with denticles from mesal process nearly to anal extremity. Harpe stout at base, with long, acutely-pointed sacculus present; cucullus slender, curved, slightly inflated at apex. Juxta about as wide as long, anterior margin slightly concave, posterior notched, lateral margins deeply concave. Eighth sternite armed with a stout median process.

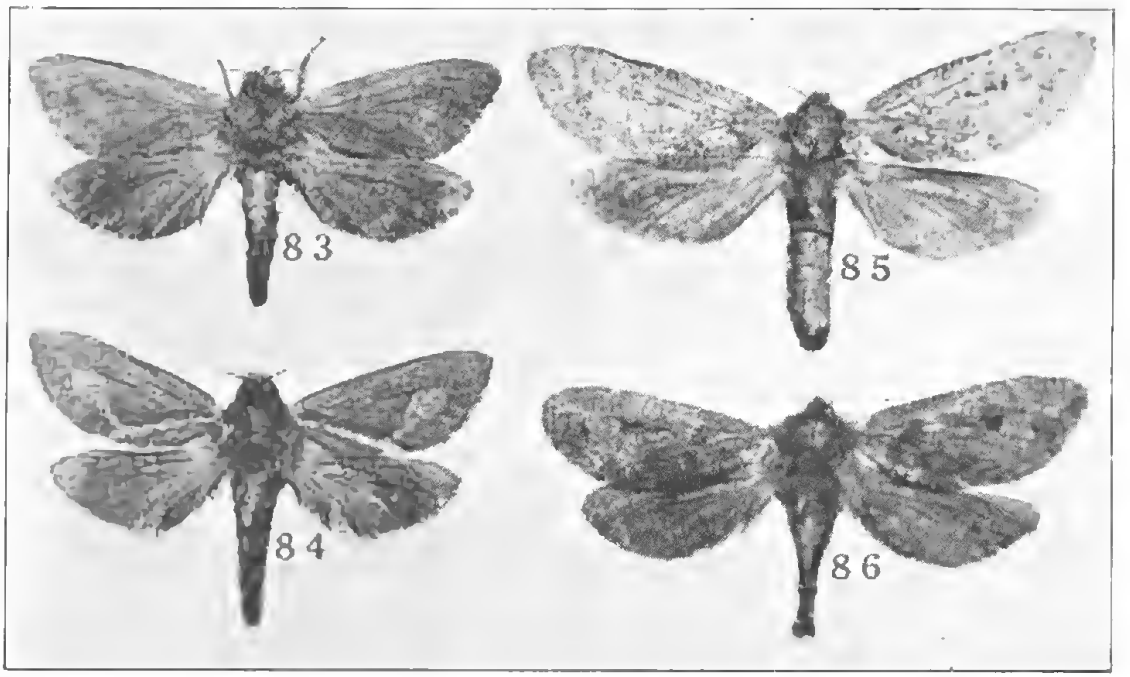

Fig. 83-86. *Oncopera mitacra* (Turner). 83, type, a male, Kuranda; 84, male, Kuranda; 85, female, Kuranda; 86, female, Cairns.

Three forms or aberrations of the male of this species have been described by Aurivillius but have not yet been recognized amongst our material:

f. *suffusa* Aurivillius. "Alae anticae supra ochraceae faseiis tribus irregularibus fusco-brunneis, ad marginem posticum conjunctis costam autem haud attingentibus ornatae; fasciae duae primae latae, tertia submarginalis angustior et prope medium excurvata, omnes guttis parvis niveis irregulariter conspersae."

f. *lineata* Aurivillius. "Alae anticae supra subaequaliter fusco-brunneo-et ochraceo-variegatae, inter marginem posticum et costam 7 linea postdiscali undulata nivea fusco marginata ornatae."

f. *vittata* Aurivillius. "Alae anticae supra brunneo-ochraceae vitta mediana fere a basi ad apicem cellulae et deinde in plagam magnam apicem et angulum posticum versus dilatata ornatae."

These three male forms were taken at Malanda, Queensland, in association with normal examples. In the absence of figures it is not possible to state whether they are colour forms of *O. milocera* or separate species.

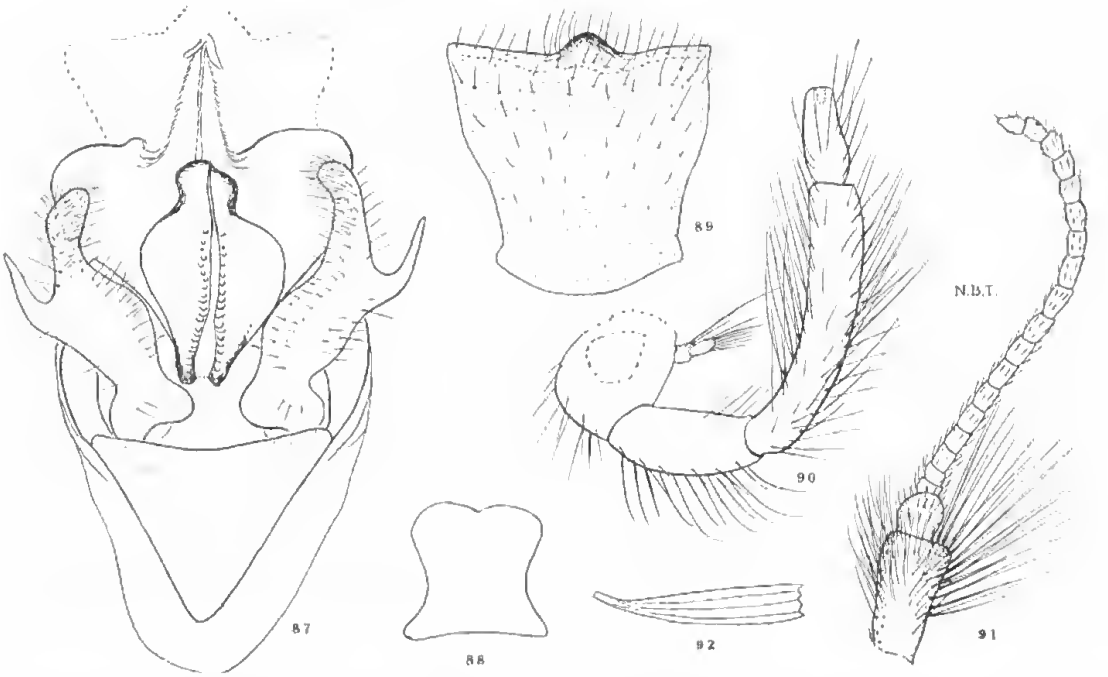

Fig. 87–92. *Oncopera milocera* (Turner). 87, male genitalia; 88, juxta; 89, eighth sternite; 90, labial palp, showing rudimentary maxillary palp; 91, antenna; 92, an antennal scale.

This species is of considerable economic importance, owing to its depredations, in the larval state, upon the pasture lands of the Atherton Tableland in North Queensland. Some details of the life-history are known. According to Atherton, who has made some interesting observations, *Oncopera* moths are on the wing between January and April. Eggs are distributed freely among the grass, and larvae may be collected from July to December; when full grown they attain a length of over 5 cm. "Pupation takes place in the larval burrow from December to March at a depth of 4 to 6 inches. . . . The . . . vertical burrows excavated by the grubs may be from less than 6 inches to more than 15 inches in depth, the last 3 or 4 inches being unlined with silk. The larvae may construct a chamber in the burrow just below the surface of the ground, which possibly facilitates turning when excavations are in progress. The soil is apparently collected from the base of the extending burrow and held in the mouth parts as the larva backs into the chamber, in which it turns before carrying the burden outside. . . . It is commonly found that in pastures with a fairly long growth . . . the larva builds

a sort of anteroom over its burrow . . . brought to within ½ inch of the surface, and there flared out like the top of a test tube. Built over the top of this is a covering consisting of pieces of earth and dead grass. . . . The whole of the cavity is lined with silk, and a passage-way of similar material leads away from it in a horizontal direction."

On general grounds it is tempting to disagree with Atherton's conclusions (not quoted here), which suggest that *O. mitocera* was originally a rain-forest dweller, with a dead-leaf-eating larva, and that its attacks on pasture grasses are an induced habit brought about by the clearing of the jungle and the destruction of its normal food. It seems possible that the observed differences of habit between the grass-feeding larvae which build an ante-room to their silk-lined burrow, and the rain-forest-dwelling, dead-leaf-eating larvae with an unprotected entrance to the burrows, are of a specific nature.